REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-5, and 7-15 are pending active examination. Claims 1 and 9 are amended to provide a clearer presentation of the claimed subject matter. Applicant submits that no new matter has been added. Claims 2, 3, 6, 7, and 13-15 are canceled without prejudice or disclaimer. No new claims have been added.

In the Office Communication dated August 1, 2008 pertaining to the Decision on Appeal rendered by The Board of Patent Appeals and Interferences for the present application, claims 1-5 and 7-13 stand rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Tomoyasu '583 (U.S. Patent Application Publication No. 2004/0185583); claims 1-3 and 7-13 stand rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Natzle '047 (U.S. Patent Application Publication No. 2004/0097047) in view of Tomoyasu '583 or Newton '377 (U.S. Patent Application Publication No. 2004/0099377); and claims 4 and 5 stand rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over Natzle '047 in view of Tomoyasu '583 or Newton '377 and further in view of Doris '981 (U.S. Patent Application Publication No. 2004/0241981).

To be clear and to the point, the prior art rejections are improper and must fail for at least the reason that none of the asserted references, whether taken alone or in combination, teach or suggest the entire claimed combination of elements as currently amended. Accordingly, Appellants respectfully traverse the outstanding rejections set forth by the Examiner.

Appellants further submit that, at the very least, none of the asserted references teach or suggest:

> performing a chemical oxide removal process using a process recipe including a first reactant, a second reactant, an inert gas and a process pressure in order to acquire trim amount data as a function of a variable parameter, while maintaining at least one constant parameter constant, wherein said variable parameter is one of a first group of parameters ***including a partial pressure of said first reactant, and a partial pressure of said second reactant***, and said at least one constant parameter different from said variable parameter is ***a molar ratio of said first reactant and said second reactant, and a process pressure***;
>
> determining a ***single, continuous*** relationship between said trim amount data and said variable parameter ***for said trim amount data ranging up to about 35 nm*** [Emphasis Added].

The Examiner asserted that Tomoyasu '583 renders claims 1-5 and 7-13 unpatentable as the reference allegedly teaches or suggests each and every claim element. Appellants respectfully submit that these rejections are woefully unsupported. In particular, the grounds of rejections rest squarely on the Examiner's assertions that Tomoyasu '583 teaches the use of first and second reactants and combinations thereof (Tomoyasu '583: par. [**0200**]) and the setting of an amount of an inert gas in order to achieve the trim amount (Tomoyasu '583: par. [**0007**]). (*See*, Final Office Action, page 3). The Examiner further asserted that Tomoyasu '583 teaches adjusting one or more chemical processing parameters and that such disclosure reads on the claimed maintaining at least one constant parameter constant. (*See*, Final Office Action: pages 9-10).

In particular, Tomoyasu '583 discloses a method of operating a processing system **150** to treat a substrate that includes, *inter alia*, performing at least one of setting, monitoring, and adjusting one or more chemical processing parameters for the chemical treatment system, wherein the one or more chemical processing parameters comprise at least one of a chemical treatment processing pressure, a chemical treatment chamber temperature, a chemical treatment gas distribution system temperature, a chemical treatment substrate temperature, a chemical treatment substrate holder temperature, and a chemical treatment gas flow rate. (*See*, Tomoyasu '583: par. [**0007**]).

Tomoyasu '583 teaches that processing subsystem **150** includes a Chemical Oxide Removal (COR) module **154** and a Post Heat Treatment (PHT) chamber **156**. The COR module **154** performs the first step of the COR process, which is a reaction between a mixture of process gases, such as HF and ammonia gases, and silicon dioxide that forms a solid reaction product on the wafer surface. The PHT module **156**, performs the second step of the COR process, which causes the evaporation of the solid reaction product by heating the wafer. (*See*, Tomoyasu '583: par. [**0052**]).

Tomoyasu '583 further discloses that a predicted state for the wafer may be computed based on the input state, the process characteristics, and a process model. For example, a trim rate model can be used along with a processing time to compute a predicted trim amount. Alternately, an etch rate model can be used along with a processing time to compute an etch depth, and a deposition rate model can be used along with a processing time to compute a

deposition thickness. Other models identified by Tomoyasu '583 include SPC charts, PLS models, PCA models, FDC models, and MVA models. (*See*, Tomoyasu '583: par. [**0074**]). The process model may also provide input parameters for gas flow rate ratios, for example, the R2R controller can calculate and establish a gas flow ratio and adjust the total flow of the combined gases. (*See*, Tomoyasu '583: par. [**0088**]).

With this said, Applicant remains at a loss as to how these disclosures (*i.e.*, the adjustment of one or more chemical processing parameters, trim rate modeling techniques, and processing times) can be construed to correspond to the specific recitations of ***acquiring of trim amount data as a function of a variable, while maintaining at least one constant parameter constant***, wherein the variable parameter is one of a first group of parameters including ***a partial pressure of a first reactant and a partial pressure of a second reactant***, and the at least one constant parameter is different from the variable parameter ***includes a molar ratio of the first reactant and the second reactant and a process pressure,*** and ***determining a single, continuous relationship between the trim amount data and said variable parameter for said trim amount data ranging up to about 35 nm***, as required by claim 1.

In other words, there is no discussion or suggestion in Tomoyasu '583 of a first reactant, a second reactant, an inert gas, and a process pressure to acquire trim amount data as a function of a variable parameter while maintaining at least one constant parameter constant and to determine a single, continuous relationship between the trim amount data and said variable parameter for said trim amount data ranging up to about 35 nm, as specifically required by claim 1. Nor is there any discussion of a relationship between trim amount data and a partial pressure of a gas specie and an inert gas. Appellant cautions that the mere discussion of different modeling techniques even when coupled with a listing of gases that can make up the process gas, ***cannot*** be said to lead those skilled in the art to the relationships specifically recited by the present claims without some additional discussion or suggestion. Appellant respectfully submits that the absence of any correlation between specifically-recited variables such as a first reactant, a second reactant, an inert gas, a process pressure, partial pressure of a gas specie, or partial pressure of an inert gas clearly undermines the Examiner's assertions.

With regard to the use of inert gases, and in contrast to the Examiner's cited passages, the few instances in which Tomoyasu '583 actually mentions the use of an "inert gas" (*e.g.*, argon) is in connection with the orifice configurations of the gas distribution system and the possible use of a heat transfer gas. That is, Tomoyasu '583 discloses that the first and second arrays of one or more orifices **1444**, **1448** are configured to distribute gas, which can, for example, comprise NH_3, HF, H_2, O_2, CO, CO_2, Ar, He, *etc.* (*see*, Tomoyasu '583: par. [**0200**]) and that a heat transfer gas may be delivered to the back-side of substrate **1242** via a backside gas system to improve the gas-gap thermal conductance between substrate **1242** and substrate holder **1240** (*see*, Tomoyasu '583: par. [**0195**]). The heat transfer gas supplied to the back-side of substrate **1242** can comprise an inert gas such as helium, argon, xenon, krypton, a process gas such as CF_4, C_4F_8, C_5F_8, C_4F_6, *etc.*, or other gas such as oxygen, nitrogen, or hydrogen.

It should be clear that such descriptions fail to teach or suggest the specific use of a ***first reactant, a second reactant, an inert gas*** and a process pressure in order to ***acquire trim amount data as a function of a variable parameter***, as required by claim 1.

For at least these reasons, Appellants submit that the Examiner has not presented a *prima facie* case of obviousness with respect to independent claim 1 and that this claim is not rendered obvious by Tomoyasu '583. As such, claim 1 is clearly patentable. Moreover, because claims 2-3, 7, and 13 are canceled, and claims 4-5 and 8-12 depend from claim 1, respectively, claims 4-5 and 8-12 are also patentable at least by virtue of dependency as well as for their additional recitations.

The Examiner asserted that Natzle '047 renders claims 1-3 and 7-13 unpatentable by alleging that the reference teaches a chemical oxide removal process using a process recipe including a first a reactant, a second reactant, and a process pressure. The Examiner acknowledged that Natzle '047 fails to teach the use of an inert gas and, therefore, relied on Tomoyasu '583 or Newton '377 as allegedly teaching such a feature. (*See*, Final Office Action: page 7). Appellant strenuously disagrees.

Natzle '047 discloses the use of a pre-cleaning step by introducing a CMOS device **10** into a Chemical Oxide Removal (COR) chamber **44**, which employs gas phase reactants (*e.g.*, HF and NH_3) to perform a self-limiting etch that is adjustable by controlling the parameters in the COR chamber **44**. (*See*, Natzle '047: par. [**0037**]). Natzle '047 also discusses the

adjustment of the amount of HF and NH_3 to allow shaping of the curved silicon oxide **18**. (*See*, Natzle '047: par. [**0051**]). Natzle '047 further discloses that the completion of the reaction and the amount of the gate dielectric layer **14** and the reoxidized silicon oxide layer **18** that are removed is a function of the substrate temperature, composition and residence time of the adsorbed reactant film **20**. Factors influencing the amount removed per unit time include the vapor pressure of the reactant at the temperature of the substrate **12**, the amount of reactant or the rate of reactant admitted to the COR chamber **44**, the pumping speed of pump **60**, and the reaction rate between the adsorbed reactant film **20** and the reoxidized silicon oxide layer **18** to be etched. (*See*, Natzle '047: par. [**0042**]).

Appellant points out, however, that the mere discussion of an adjustment of the amount of specific gases or a discussion of general factors that influence the removal of oxide per unit time, without any discussion of a specific interaction between the variables, ***cannot*** support the Examiner's assertions. The deficiency lies in the absence of any correlation between specific factors.

Moreover, as admitted by the Examiner, there is nothing in Natzle '047 that remotely teaches or suggests the use of inert gases. And, for the reasons noted above, Tomoyasu '583 is incapable of curing these deficiencies. That is, both Natzle '047 and Tomoyasu '583 clearly fail to teach or suggest the specific use of a ***first reactant, a second reactant, an inert gas*** and a process pressure in order to ***acquire trim amount data as a function of a variable parameter***, as required by claim 1.

With regard to Newton '377, this reference is directed to an apparatus and method that provides controlled etching of an adapted surface layer of a workpiece or wafer by reaction of the adapted surface layer with ammonium bifluoride (NH_5F_2), forming a self-limiting etchable layer, ammonium hexafluorosilicate, ($(NH_4)_2SiF_6$), that may be removed by thermal desorption, in which NH_5F_2 may be formed by mixing a first fluid, ammonia (NH_3) and a second fluid, hydrogen fluoride (HF). (*See*, Newton '377: par. [**0026**]).

Newton '377 discloses a chamber **7** that includes a sandwich **119** of an electrostatic chuck **110**, and upper annular ring **103**, a cathode insulator **105**, and a lower annular ring **125** that contains a plurality of exhaust holes **127** for distributing an exhaust flow provided by a vacuum pump through the exhaust port **83**. The exhaust flow that originates from the exhaust port **83** and distributed through the plurality of exhaust holes **127** of the lower annular ring

125, resulting in a uniform or homogeneous atmosphere of reactive fluids over the workpiece **30** in the chamber **7**. (*See*, Newton '377: par. [**0050**]; FIG. 4).

Newton '377 further discloses that "reactive fluids" refer to the first fluid, the second fluid, in which the first or second fluids may be ammonia (NH_3) or hydrogen fluoride (HF) and ammonium bifluoride (NH_5F_2) and combinations thereof. Providing the reactive fluids over the adapted surface layer **32** of the workpiece **30**, as a uniform or homogeneous atmosphere, forms the self-limiting etchable layer **50** that includes layers made of materials such as ammonium hexafluorosilicate ($(NH_4)_2SiF_6$), that may become impervious to continued exposure to hydrogen fluoride (HF). Such imperviousness is the basis for the layer **50** being a self-limiting etchable layer. (*See*, Newton '377: par. [**0050**]; FIG. 4).

Regarding the use of inert gases, Newton '377 merely discloses that fluid feed lines **97**, **99** or chamber **7** may be optionally provided with Ar or N_2 gas. (*See*, Newton '377: par. [**0034**], [**0073**]).

Appellant fails to comprehend as to how the mere mention of these gases would somehow lead those skilled in the art to understand or determine the nature of the relationship between the trim amount and the amount of an inert gas, among other claimed features. In other words, like Tomoyasu '583, there is no discussion in Newton '377 of a first reactant, a second reactant, an inert gas, and a process pressure to acquire trim amount data as a function of a variable parameter while maintaining at least one constant parameter constant, as required by claim 1.

For at least these reasons, Appellants submit that the Examiner has not presented a *prima facie* case of obviousness with respect to independent claim 1 and that this claim is not rendered obvious by Natzle '047 in view Tomoyasu '583 or Newton '377. As such, claim 1 is clearly patentable. Moreover, because claims 2-3, 7, and 13 are canceled, and claims 4-5 and 8-12 depend from claim 1, respectively, claims 4-5 and 8-12 are also patentable at least by virtue of dependency as well as for their additional recitations.

Lastly, the Examiner alleged that claims 4-5 are unpatentable over Natzle '047 in view of Tomoyasu '583 or Newton '377 and Doris '981. Appellant disagrees.

Appellant substantially relies on the reasons presented above regarding the patentability of independent claim 1. That is, the Doris '981 reference does not assist the

Examiner with a rejection of the claims because it suffers from the same deficiencies noted with respect to Tomoyasu '583 and Natzle '047. While Doris '981 does describe heating the structure and rinsing the structure in water, it provides no discussion, whatsoever, of a correlation between specific variables such as a first or second reactant, an inert gas, a process pressure, partial pressure of a gas specie, and partial pressure of an inert gas to support the Examiner's rejection of the claims. Thus, based on the aforementioned reasons, Appellants respectfully submit that claims 4-5, which depend from claim 1, are also patentable at least by virtue of dependency as well as for their additional recitations.

CONCLUSIONS

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Should the Examiner have any questions or deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

Charge Deposit Account

Please charge our Deposit Account No. 50-3451 for any additional fee(s) that may be due in this matter, and please credit the same deposit account for any overpayment.

Respectfully submitted,

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